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that of the grid to be pasted. The grids are passed across the opening by rolls, have their cavities filled with the red lead which is being forced out, and then pass between wheels whose distance apart is equal to their thickness, where they are polished, the grids coming from the machine with their perforations filled with paste of an equal density at every point. The different rolls and wheels, and the screw, are geared together, so that their relative speeds are invariable.

The method of manufacturing the support plates, or 'grids,' has also been improved upon. The old method was simply to cast them; and, although the process was a cheap one, yet the plates lacked in strength and density. Mr. Madden has devised a press by which they are formed by hydraulic pressure. Besides the advantages of greater density and homogeneity, giving an improved strength and conductivity, the process allows smaller holes and thinner partitions than can be obtained by casting.

These improvements in manufacture should result in a greatly reduced cost, and in an increased efficiency and length of life. Storage-batteries are just at the point of becoming economical for many purposes, and a moderate reduction in cost and depreciation will turn the balance.

NEW STREET-CAR MOTOR OF THE SPRAGUE COMPANY.— Since the beginning of the year, the Sprague Electric Railway and Motor Company has equipped a number of street-railways with electric-motor cars, some of the installations having been difficult and important. The result of the year's experience has been the adoption of a motor differing considerably in type from that heretofore used, which has been described in this journal. In the new form a single magnetic circuit is used, as in the Edison dynamos, the axle of the car passing through bearings on the yoke. At the other end the poll-pieces are suspended from a cross-piece on the truck by a heavy spiral spring. Another spring below prevents the motor from rising when the motion of the car reverses. The motion is transmitted from the armature to the wheel-axle by two pairs of gears, — one on each side of the car, — one of the wheels in each case being of fibre to deaden all noise. The reduction is 12 to 1. There are two commutators on each armature, — one at each end, — with a single brush for each. The object of this is to have all the brushes on top, where they can be easily adjusted and inspected. It also decreases the wear. The old form of brush consisted of a number of strips of copper riveted together, and set at a slight angle with the commutator bars. This allowed the direction of rotation to be reversed; but there was more or less wear, especially when the armature revolved against the brushes. In the new brush a number of thin laminae of copper are strung on a rod in a bevelled holder, and bear almost straight down on the commutator, inclining slightly in the direction of motion. When the machine is reversed, the strips are first carried up to the vertical, and then a little past it in the new direction of rotation, until brought up by the inclined sides of the holder. The motors are controlled as formerly, by switches on the two platforms of the car, and the cars are intended to travel in both directions. The whole arrangement is compact, and should be extremely efficient. It is an improvement on the old type of motor, which has been very successfully used.

ELECTRICITY FOR TEMPERING STEEL.— Electricity has been successfully applied for tempering watch-springs and other forms of spring steel, whether in the form of ribbon or wire. The steel is wound on a spool, whence it passes down through a bath of oil. An electric current is sent through the wire, of such strength as to keep it at the proper redness to answer the desired requirements of temper. As the heating is not done in contact with the air, but is entirely beneath the surface of the oil, there is no trouble from blistering, as in the ordinary methods. The final temper is drawn in the same manner, and the wire or ribbon is finished by means of rolls. The process is also applied to a number of springs besides those for watches, including piano-wires. In all cases the process can be controlled to a nicety, both as to the exact temper and its uniformity through the wire.

STANDARDS OF LIGHT.— The committee of the British Association, of which Prof. Vernon Harcourt is chairman, has submitted a report on comparative tests of standards of light. These tests,

made on six classes of standards, have been carried on for four years, and as a result the committee recommends the pentane lamps. Ordinary sperm candles vary, because the sperm is not a definite chemical compound; and the luminosity varies with the composition, and the locality and length of the wick. The flame is also liable to fluctuate. It is difficult to obtain sperm candles perfectly free from oil. Perfectly dry sperm has a comparatively high melting-point, and candles made of such material require a thicker wick; so that candles of the same size made of this material give less light than those formerly accepted as standards. The amylacetate lamps are constant, but their reddish light is against them. The pentane standard is reliable: it has no wick, and the light does not alter with slight variations in the specific gravity of the pentane. In a special series of comparative tests as to the merits of the amylacetate lamp, the pentane standard, and the pentane lamp, the pentane lamp was found almost as good as the pentane standard. Three observers recorded the results, and changed their positions after each set of simultaneous observations. The pentane lamps differed, in a total of 1,118 tests, by 1 per cent in 86 cases, by 2 per cent in 57 cases, by 5 per cent in 19 cases, and in a few instances by 10 per cent. Other tests were made to reduce the platinum unit of M. Viole — the light given off by a square centimetre of platinum at its melting-point — to a practical shape. Platinum-foil with a surface of a quarter of a square inch was stretched over rollers and heated to its melting-point, but the results were too variable to be of value. When wound over steel rollers, the heat was conducted away too rapidly. Experiments with platinum fused by the blowpipe were equally unsatisfactory. The heating of a platinum strip by the current of eight or ten accumulators gave better results, but the platinum is apt to buckle. Other lamps and flames were also tried. Carbon filaments waste, nor would the action of photographic rays on sensitive-plates lend itself to standard tests. The committee therefore recommends the pentane standard and also the pentane lamp.

EFFECT OF ELECTRIC CURRENTS ON PLANTS.— Prof. E. Wollny of Munich has experimented on the effect of electric currents of different intensities and characters on the growth of plants. Small plats of about four metres square were provided, and were separated by plates penetrating twenty-five centimetres into the soil. On the two sides of one of these beds, plates of zinc were sunk, the dimensions being thirty centimetres by two metres. They were connected by an insulated wire, with five Meidinger cells in the circuit. Another enclosure had an alternating current constantly sent across it, while in a third there were simply buried a copper and zinc plate connected above the earth by an insulated wire. The three enclosures were therefore subjected to different conditions, — to a weak direct current, to a comparatively strong direct current, and to an alternating current. Several specimens of grain, potatoes, carrots, etc., were planted, and were subjected to the action of the currents until they reached maturity. Comparing them with plants grown under ordinary conditions, the result to which Professor Wollny is led is, that electricity, whether under the form of continuous currents of different intensities or of alternating currents, exerts no influence on the vegetation of plants.

HEALTH MATTERS.

Depressed Areas as Health-Resorts.

DR. WALTER LINDLEY of Los Angeles, Cal., contributes to the *New York Medical Record* an interesting paper on the effect upon invalids and others of compressed air below the sea-level. He says that in the eastern part of San Diego County, about one hundred miles from Los Angeles, is a depression traversed by the Southern Pacific Railroad, known to geographers as the San Felipe Sink, but commonly called, on account of the innumerable shells spread over its surface, the Conchilla Valley. This basin is about one hundred and thirty miles in length by thirty miles in average width. The deepest point is about three hundred and sixty feet below sea-level.

In this valley live about four hundred of the Cohuilla Indians. This is an interesting tribe. Dr. Stephen Bowers, in a paper read before the Ventura County Society of Natural History, March 5,

1888, said that he believed them to be of Aztec origin. They are sun and fire worshippers, and believe in the transmigration of souls, and that their departed friends sometimes enter into coyotes, and thus linger about their former habitation. They practise cremation. Their principal article of food is the mesquite-bean, which they triturate in mortars of wood or stone, after which the meal is sifted; and the coarser portion is used as food for their horses and cattle, and the finer is made into cakes for family use. Dr. Lindley found, on a visit here, asthmatics, rheumatics, and consumptives, all of whom reported wonderful recoveries. Some of these stories he accepted *cum grano salis*, which quotation is, by the way, especially applicable to the salt-fields. These asthmatics and consumptives claim that the farther they get below sea-level, and the dryer the atmosphere, the easier they breathe. The rheumatics claim that the heat and dryness improves the circulation, and thus relieves them. Dr. Lindley did not stay long enough to make any trustworthy observations; but he thought, that, aside from dryness—mean annual relative humidity certainly not over twenty-five—and equability, there was considerable atmospheric pressure at a point three hundred and fifty feet below sea-level, and that there was here moderately compressed air on a large scale. In a recent paper on the use of the pneumatic cabinet, the author, from many cases in practice, showed that compressed air relieves asthmatics and cases of phthisis. He says the compressed air will gradually force its way into every part of the lung, in order that the pressure may be the same on the inside as on the out. While the proportion of oxygen is, of course, not increased, yet there is an increased quantity in a given space, and we really have the oxygen treatment here on an extensive scale.

In connection with his paper, Dr. Lindley adds an interesting note in which he gives the following list of other places below sea-level: "Sink of the Amorgosa (Arroyo del Muerto), in eastern California, two hundred and twenty-five feet below sea-level; the Caspian Sea, eighty-five feet below sea-level. Lake Assal, east of Abyssinia in the Afar country, eight miles long and four miles wide, is about seven hundred and sixty feet below sea-level. Its shores are covered with a crust of salt about a foot thick. This salt is a source of revenue to the Afars, as they carry it by caravans to Abyssinia, where they find a ready market. There are several other depressions about six hundred feet below sea-level in this vicinity. The noted oasis Siwah, in the Libyan desert, three hundred miles west of Cairo, is one hundred and twenty feet below sea-level. Here are beautiful date-palm groves, and here also the apricot, the olive, the pomegranate, and the vine are extensively cultivated. In this same desert is the oasis Araj, two hundred and sixty-six feet below sea-level. There are also numerous other depressions in the desert portion of Algeria and at various points on the Sahara Desert."

Garbage-Cremation.

Our readers who are interested in garbage-cremation will find an excellent paper on this subject in the *Journal of the American Medical Association*, Oct. 13, 1888. The author of the paper is Dr. J. Berrien Lindsley of Nashville, Tenn. Dr. Lindsley is the treasurer of the American Public Health Association, and has made the cremation of garbage a special study. The difficulties connected with the disposition of a city's refuse may be imagined from the following statistics which he gives:—

Baltimore, August, 1887, estimated by police census, had a population of 437,155. The amount of night-soil delivered at the dumps for the year ending Dec. 31, 1887, was 51,107 loads, or 10,221,400 gallons. Probably more than half the inhabitants use water-closets, which carry off an equal amount. The dead animals, etc., removed during the same year were:

Total number of dead animals.....	25,249
“ “ “ “ fowls.....	9,074
“ “ “ “ fish.....	23,574
“ “ “ cartloads of dead fish, vegetable and other offal removed from various docks.....	1,067
“ “ “ pounds of decayed meat condemned.....	1,495
“ “ “ dozens of eggs condemned.....	607

Richmond, population 100,000. The report of contractor for removal of garbage, or kitchen refuse, year 1887, shows total number of loads carried off, 2,680 = 72,200 bushels.

Memphis, population 62,335. Number of loads of garbage removed in 1887 was 29,120.

In this country the experiment of destroying garbage by means of a furnace constructed especially for that purpose was first tried on Governor's Island, New York harbor. A description of this garbage-cremator was given in the *Sanitary Engineer* of Aug. 13, 1885, by Lieutenant Reilly, at that time acting assistant-quartermaster, United States Army.

In the twelfth volume of 'Public Health,' containing the reports and papers presented to the American Public Health Association, at the Toronto meeting, October, 1886, may be found a paper by Dr. George Baird of Wheeling, giving an account not only of the destruction of garbage, but also of night-soil, by means of a furnace contrived by M. V. Smith, M.E., Bissell's Block, Pittsburgh, Penn. In the 'Report on the Sanitary State of Montreal, for the Year 1886,' will be found an interesting narrative in this connection, giving instructive details as to cost, showing the extent of the work to be done, and the complete success of the refuse-crematories, and also of the night-soil crematories constructed by Mr. William Mann. Dr. Louis Laberge, health-officer of Montreal, read an elaborate paper on this topic at the meeting of the American Public Health Association in Memphis, last November, which will be found in the thirteenth volume of 'Public Health,' now in press. The *Sanitary News* of Nov. 19, 1887, states that at Des Moines, Io., a small Engle furnace is in experimental use, and is working very satisfactorily. At Pittsburgh a Rider furnace has just commenced its service. In Chicago a Mann furnace was being constructed. In the same journal, March 17, 1888, may be found a full description of the Chicago garbage-crematory, from which a duplicate of the plant could be built if desired. On April 14 it reports that the said crematory is doing good service in disposing of about fifty tons of material a day. The *Sanitary News* of March 10, 1888, reports the success of the disposal of garbage by cremation at Milwaukee.

HEALING OF WOUNDS.—Prof. Leon Le Fort believes that the impurity of the air has no injurious effect upon wounds, and that it may be ignored. He believes that wounds will successfully heal if perfect cleanliness is maintained by the surgeon, as to his person, and every thing used by him in his operation.

LEAD-POISONING.—Dr. Herald of Newark, N. J., has, during the past six months, had fifty cases of lead-poisoning in his practice, which he has traced to soda-water contained in the five-cent patent-stopper bottles. In some of the stoppers examined by him he found 42.4 per cent of lead, and in others 83.6 per cent. The action of the carbonic acid in the water upon the lead in the stopper ultimately produces a bi-carbonate of lead, which, when absorbed from the stomach, causes lead-poisoning.

POTATO-POISONING.—A large number of soldiers were recently poisoned while on duty at one of the French fortifications. It is believed that the solanine in unripe potatoes was the cause of the sickness.

ETHNOLOGY.

The Laws of Marriage and Descent.

At the recent meeting of the British Association, Dr. E. B. Tylor read an interesting paper on the laws of marriage and descent, illustrative of his ingenious method of studying ethnological phenomena. All myths and customs, on a close study, may by analysis be disintegrated, and are found to consist of certain elements. Dr. Tylor arranges these elements statistically, and, by inquiring which occur simultaneously among various peoples, proves that certain groups of such elements belong genetically together. This he calls the method of adhesions. The results thus obtained are of the greatest importance from a psychological as well as from an historical standpoint. As a test of the results to be obtained by this means, he examines the custom which forbids the husband and his wife's parents, although they may be on a friendly footing, to speak or look at one another, or mention one another's names. Some seventy peoples practise this or the converse custom. On classifying the marriage rules of mankind, Dr. Tylor found that the avoidance custom between the husband and the wife's family belongs preponderantly to the group of cases where the husband goes to live with